



Effect of a culturally-tailored mother-daughter physical activity intervention on pre-adolescent African-American girls' physical activity levels

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ABSTRACT

Positive parent-child attachment can be determined by opportunities for the child to interact with his/her parent and can influence a child's physical activity (PA) behavior. Therefore, an intervention that provides children and their parent more time to interact positively could impact children's PA. We examined the efficacy of a 12-week mother-daughter intervention on African-American girls' PA levels. In Spring of 2013 and 2014, mother-daughter dyads ($n = 76$) from Springfield, MA, were randomly assigned to one of three groups [child-mother (CH-M, $n = 28$), child alone (CH, $n = 25$), or control (CON, $n = 23$)] that participated in an afterschool culturally-tailored dance intervention (60 min/day, 3 days/week, 12 weeks). Girls in the CH-M group participated in the intervention with their maternal figure, while girls in the CH group participated in the intervention alone. CON group participants received weekly health-related newsletters. PA was assessed with accelerometers for seven days at baseline, 6-weeks, and 12-weeks. Hierarchical linear modeling was used to examine rates of change in PA. During the afterschool intervention time, girls in the CH-M group displayed a significantly steeper rate of increase in their percent time spent in vigorous PA compared to both the CON ($\gamma = 0.80, p < 0.001$) and the CH group ($\chi^2(1) = 13.01, p < 0.001$). Mothers in the CH-M group displayed a significantly steeper rate of increase in their percent time spent in total daily moderate-to-vigorous PA compared to CH group's mothers ($\gamma = 0.07, p = 0.01$). This culturally-tailored mother-daughter afterschool intervention influenced African-American girls' afterschool hour PA levels, but not total daily PA.

Trial Registration: Study is registered at www.clinicaltrials.gov NCT01588379.

1. Introduction

African-American girls in the U.S. suffer disproportionately from obesity (Ogden et al., 2016), representing a health disparity that worsens with age as African-American women have the highest rates of obesity (Flegal et al., 2016). One factor associated with increased obesity prevalence in children is decreased physical activity (PA) (Baranowski et al., 1992; Goran et al., 1999; USDHHS, 2008). Current data indicate that African-American girls are more likely than Caucasian girls to report not participating in any bouts of PA during a typical week (Kann et al., 2016).

Maternal health behaviors and attitudes have been shown to guide the development of children's health behavior practices (Lazarou et al., 2008; Birch and Fisher, 2000; Arredondo et al., 2006; Bauer et al., 2008). The risk and resilience framework posits that a child's development is shaped by risk factors (e.g., poor parent-child bonding) and

resilience factors (e.g., attachment to parent, positive attitude) (Hawkins et al., 1992; Catalano and Hawkins, 1996). Increased presence of resilience factors have been shown to alter a child's behavior, which can be attributed to positive parent-child attachment (Hawkins et al., 1992; Catalano and Hawkins, 1996). A child's level of attachment to their parent is determined by opportunities for the child to interact with his/her parent (Hawkins et al., 1992; Catalano and Hawkins, 1996; Hawkins and Weise, 1985; Hawkins et al., 1999). Therefore, interventions that provide children and their parent more time to interact in a positive manner can enhance the quality of the parent-child relationship.

In the African-American culture, mothers are thought to be the primary influence on their daughters' PA behavior through late adolescence by creating and supporting PA opportunities and modeling PA behavior (Davison et al., 2011; Raudsepp, 2006; Baldwin and Hopkins, 1990). Despite the key role that maternal figures play in girls' PA

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behavior, previous PA interventions have minimally involved mothers (Olvera et al., 2010; Olvera et al., 2008; Ransdell et al., 2003; Corning et al., 2010; Beech et al., 2003; Robinson et al., 2003; Robinson et al., 2010). In previous studies, maternal involvement was limited to providing informational newsletters (Olvera et al., 2010; Olvera et al., 2008; Beech et al., 2003), progress reports (Ransdell et al., 2003), family homework/projects (Corning et al., 2010), or family fun night activities (Beech et al., 2003; Robinson et al., 2003; Robinson et al., 2010). However, to date there have been limited studies in which mothers and daughters participated jointly in the intervention activities (Barr-Anderson et al., 2014). Therefore, the purpose of this study was to examine the feasibility and efficacy of a 12-week culturally-tailored mother-daughter PA intervention on the PA levels of pre-adolescent African-American girls.

2. Methods

2.1. Participant recruitment and eligibility

This study was a three-arm, parallel group, pilot randomized controlled trial. African-American girls and their mothers were recruited from the Springfield, MA, area. Girls were eligible for the study if they were between the ages of 7–10 years and identified as African-American or Black by their mothers (Robinson et al., 2003; Robinson et al., 2010). Mothers self-identified themselves as African-American or Black and were broadly defined as the primary maternal figure that resided with the girls. Participants were not eligible if they had any condition limiting their participation in the PA intervention or in the assessment of PA, or were unable to read/complete the informed consent in English. Girls provided assent, and mothers provided informed consent for themselves and for their daughter to participate in this study. The University of Massachusetts Amherst institutional review board approved this study.

After completion of all baseline measures, mother-daughter dyads were randomly assigned by block randomization to one of three [child and mother (CH-M), child alone (CH), or control (CON)] groups. Randomization was stratified by girls' BMI percentile (≥ 85 th percentile or < 85 th percentile) to ensure an equal distribution of overweight and non-overweight girls across all groups. A trained member of the research staff performed all randomization procedures. Data was collected in the spring of 2013 and 2014.

2.2. Intervention

2.2.1. Theoretical framework

This intervention was based on the social cognitive theory, which supports that behavior is developed and altered through the interplay of personal (interest in the dance program, self-efficacy); behavioral (knowledge and skills needed to participate in dance); and environmental (inclusion of the mother, safe environment) factors (Bandura, 1986; Bandura, 1997). The intervention also incorporated the African-American culture by emphasizing both surface (e.g., selected dance style and music, utilizing an African-American dance instructor) and deep (e.g., social and historical influences, the importance of the maternal figure) structure cultural influences (Resnicow et al., 1999; Gaines Jr et al., 1997; Resnicow et al., 1997).

2.2.2. Intervention development

Results from a focus group study in African-American dyads were used to develop the intervention components (Alhassan et al., 2014). The data indicated that a dance intervention (African, Jazz, and Hip-Hop) was the preferred PA format. For the dance intervention, two routines were developed for each dance style by professional dancers. Each routine consisted of a warm-up (2-minutes), moderate-to-vigorous dance movements (8-minutes) and cool-down (1-minute). Each routine was recorded on DVDs for the instructors to learn the choreography.

Experienced African-American female dance instructors were hired and trained to teach the classes. Each dance style was also accompanied by an educational curriculum, which highlighted the history of the dance style, and its impact on the African-American culture. The education curriculum was taught by the research staff. Additionally, 12 weekly health newsletters were developed utilizing educational materials from federal health agencies on topics (generated from focus group data) relevant to African-American communities in Springfield, MA (Alhassan et al., 2014). Separate newsletters covering the same content were developed for mothers and daughters. The daughters' newsletters also contained activities for them to complete and highlighted historical African-American female figures and their influence on society.

2.2.3. Implementation of intervention

Afterschool dance classes were held at a centrally located elementary school in Springfield, MA. Mothers and daughters assigned to the CH-M group and daughters assigned to the CH group underwent the same PA intervention on the same days, but at different times. The intervention was held three days/week (based on focus group data) for 12 weeks (Alhassan et al., 2014). Each intervention session included 2 h of a healthy snack and homework tutoring and 1 h of the dance intervention. Participants arrived at the intervention site and were offered healthy snacks from 3:30–4:00 pm. During the focus group, mothers indicated that a later start time would better accommodate their work schedules. Therefore, the CH group danced from 4:20–5:20 pm followed by homework tutoring. The CH-M group danced from 5:30–6:30 pm, preceded by homework tutoring. Mothers and daughters in all groups received a weekly newsletter. The CON girls were asked to attend the intervention sessions, during which girls received a healthy snack and homework tutoring for 2 h. After the completion of the 12-week study, girls in the CON and CH group were offered the dance curriculum with their mothers.

2.3. Assessments and measures

Data were collected at baseline, 6-weeks, and 12-weeks by trained data collectors. Girls' and mothers' PA levels were assessed using the Actigraph accelerometer (Actigraph, LLC, Pensacola, FL). Accelerometers have been validated for PA assessment in children and adults (Sirard and Pate, 2001; Trost et al., 2005; Troiano et al., 2008; Freedson et al., 1998). Accelerometers were attached to an adjustable elastic belt worn on the participant's right hip and programmed to store data in 60-second epochs. Participants were asked to wear the accelerometers during all waking hours for seven consecutive days and to remove it only when sleeping or when it would get completely wet. Accelerometer data were reduced using Actilife software (version 6.9.1). Wear time was determined using the Choi (2011) algorithm (Choi et al., 2011). A valid wear day consisted of at least 480 min of wear time on at least three days (including one weekend day). Percent time spent in sedentary behavior and all activity intensities for total day (8 am–10 pm) and afterschool intervention time (3:30 pm–6:30 pm) were determined using the Troiano (2008) cut points for adults (mothers) and Evenson (2008) cut points for children (daughters) (Troiano et al., 2008; Evenson et al., 2008).

Participants' height and weight were measured using a stadiometer and a digital scale, respectively. BMI was calculated as weight (kilograms) divided by height (meters) squared. For girls, BMI percentiles were calculated using the Centers for Disease Control and Prevention Growth Charts (Ogden et al., 2002). Demographic information was collected from mothers at baseline using a structured questionnaire. Sexual maturation (reported by mothers) was measured at baseline using the Peterson development scale (Morris and Udry, 1980; Wilson et al., 1991). Girls and mothers were asked to report their PA preference using a validated self-report instrument (Robinson et al., 2003). Girls' PA self-efficacy was assessed using the Child Self-Perception of Adequacy and Predilection for PA Scale (CSAPPA, test-retest reliability,

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